FIG. 1

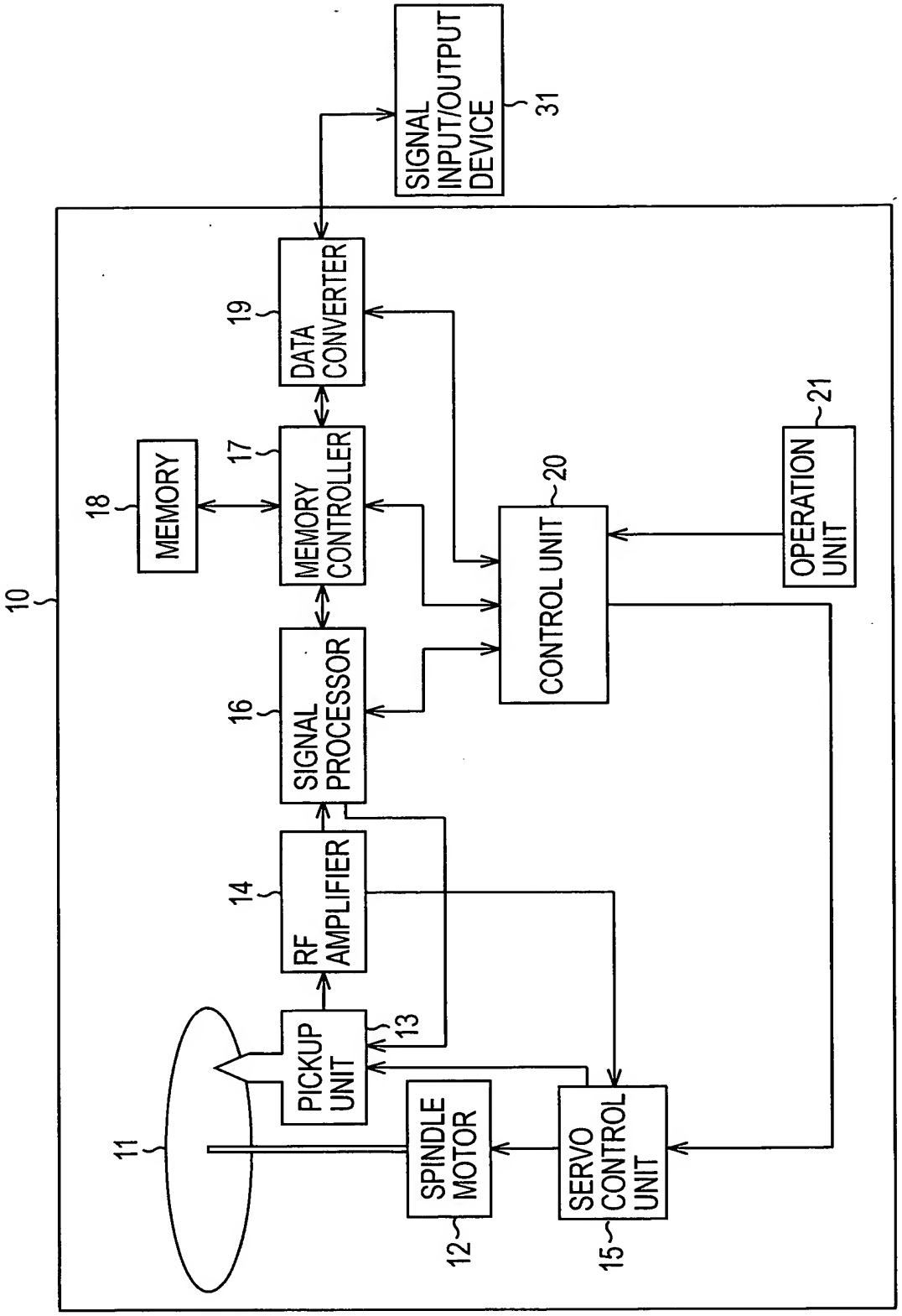

SIGNAL INPUT/OUTPUT DEVICE
31
10
19
DATA CONVERTER
18
MEMORY
17
MEMORY CONTROLLER
20
CONTROL UNIT
21
OPERATION UNIT
16
SIGNAL PROCESSOR
14
RF AMPLIFIER
13
PICKUP UNIT
11
SPINDLE MOTOR
12
SERVO CONTROL UNIT
15

FIG. 2

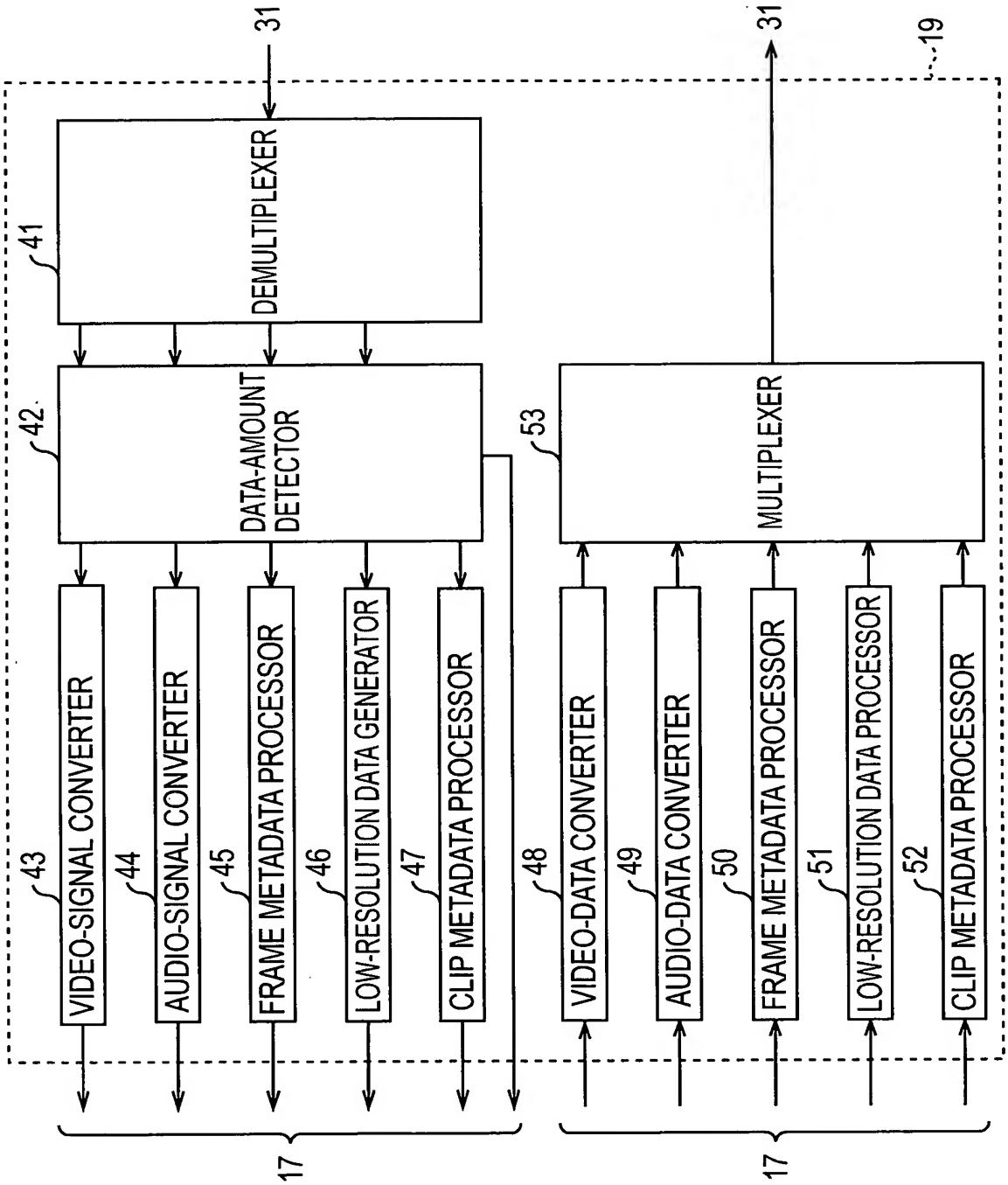

31
19
31
41
DEMULTIPLEXER
42
DATA-AMOUNT DETECTOR
53
MULTIPLEXER
43
VIDEO-SIGNAL CONVERTER
44
AUDIO-SIGNAL CONVERTER
45
FRAME METADATA PROCESSOR
46
LOW-RESOLUTION DATA GENERATOR
47
CLIP METADATA PROCESSOR
48
VIDEO-DATA CONVERTER
49
AUDIO-DATA CONVERTER
50
FRAME METADATA PROCESSOR
51
LOW-RESOLUTION DATA PROCESSOR
52
CLIP METADATA PROCESSOR
17
17

FIG. 3

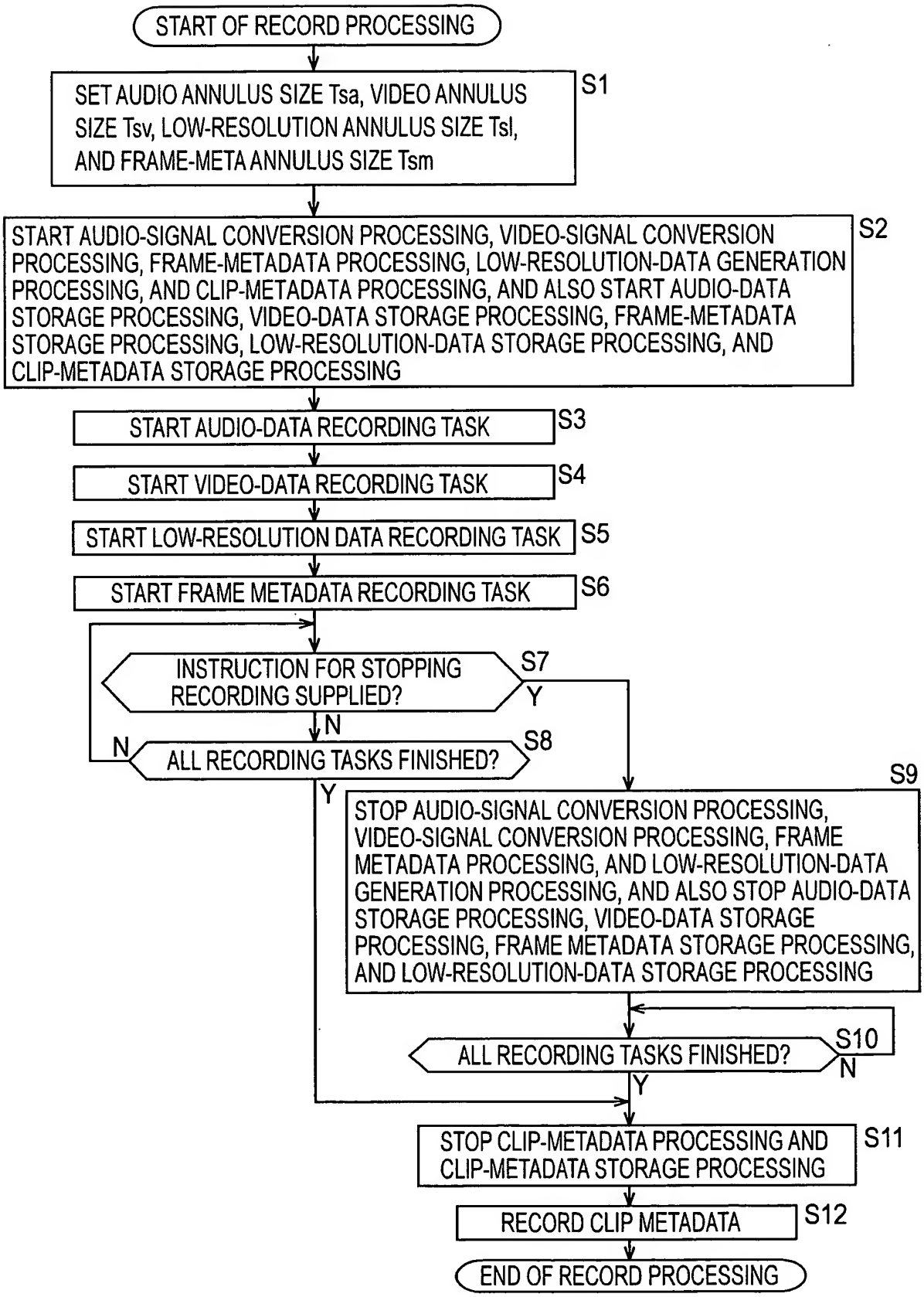

START OF RECORD PROCESSING
SET AUDIO ANNULUS SIZE Tsa, VIDEO ANNULUS SIZE Tsv, LOW-RESOLUTION ANNULUS SIZE Tsl, AND FRAME-META ANNULUS SIZE Tsm
S1
START AUDIO-SIGNAL CONVERSION PROCESSING, VIDEO-SIGNAL CONVERSION PROCESSING, FRAME-METADATA PROCESSING, LOW-RESOLUTION-DATA GENERATION PROCESSING, AND CLIP-METADATA PROCESSING, AND ALSO START AUDIO-DATA STORAGE PROCESSING, VIDEO-DATA STORAGE PROCESSING, FRAME-METADATA STORAGE PROCESSING, LOW-RESOLUTION-DATA STORAGE PROCESSING, AND CLIP-METADATA STORAGE PROCESSING
S2
START AUDIO-DATA RECORDING TASK
S3
START VIDEO-DATA RECORDING TASK
S4
START LOW-RESOLUTION DATA RECORDING TASK
S5
START FRAME METADATA RECORDING TASK
S6
INSTRUCTION FOR STOPPING RECORDING SUPPLIED?
S7
Y
N
N
ALL RECORDING TASKS FINISHED?
S8
Y
S9
STOP AUDIO-SIGNAL CONVERSION PROCESSING, VIDEO-SIGNAL CONVERSION PROCESSING, FRAME METADATA PROCESSING, AND LOW-RESOLUTION-DATA GENERATION PROCESSING, AND ALSO STOP AUDIO-DATA STORAGE PROCESSING, VIDEO-DATA STORAGE PROCESSING, FRAME METADATA STORAGE PROCESSING, AND LOW-RESOLUTION-DATA STORAGE PROCESSING
ALL RECORDING TASKS FINISHED?
S10
N
Y
STOP CLIP-METADATA PROCESSING AND CLIP-METADATA STORAGE PROCESSING
S11
RECORD CLIP METADATA
S12
END OF RECORD PROCESSING

FIG. 4

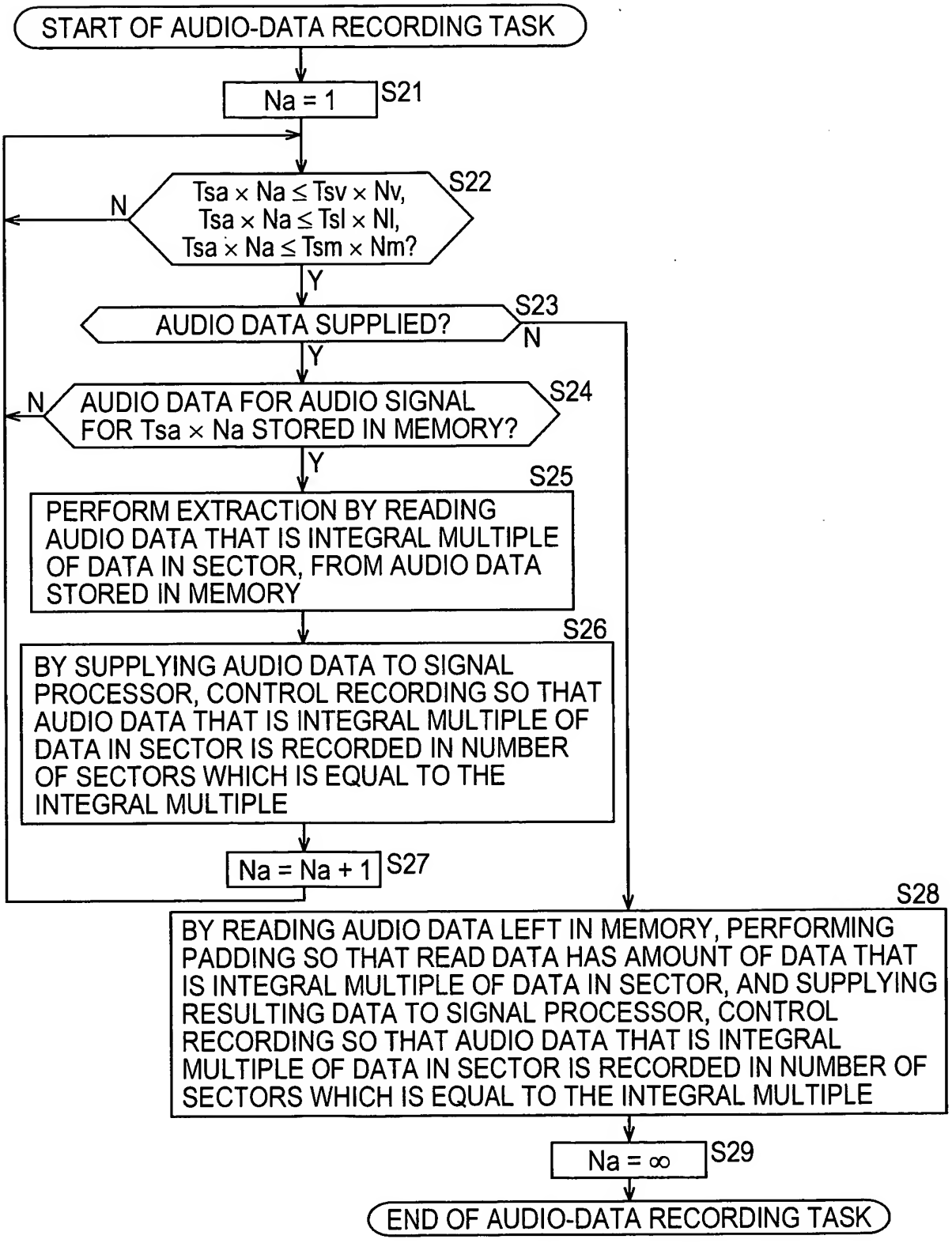

START OF AUDIO-DATA RECORDING TASK
Na = 1
S21
Tsa × Na ≤ Tsv × Nv,
Tsa × Na ≤ Tsl × Nl,
Tsa × Na ≤ Tsm × Nm?
S22
N
Y
AUDIO DATA SUPPLIED?
S23
N
Y
AUDIO DATA FOR AUDIO SIGNAL FOR Tsa × Na STORED IN MEMORY?
S24
N
Y
PERFORM EXTRACTION BY READING AUDIO DATA THAT IS INTEGRAL MULTIPLE OF DATA IN SECTOR, FROM AUDIO DATA STORED IN MEMORY
S25
BY SUPPLYING AUDIO DATA TO SIGNAL PROCESSOR, CONTROL RECORDING SO THAT AUDIO DATA THAT IS INTEGRAL MULTIPLE OF DATA IN SECTOR IS RECORDED IN NUMBER OF SECTORS WHICH IS EQUAL TO THE INTEGRAL MULTIPLE
S26
Na = Na + 1
S27
BY READING AUDIO DATA LEFT IN MEMORY, PERFORMING PADDING SO THAT READ DATA HAS AMOUNT OF DATA THAT IS INTEGRAL MULTIPLE OF DATA IN SECTOR, AND SUPPLYING RESULTING DATA TO SIGNAL PROCESSOR, CONTROL RECORDING SO THAT AUDIO DATA THAT IS INTEGRAL MULTIPLE OF DATA IN SECTOR IS RECORDED IN NUMBER OF SECTORS WHICH IS EQUAL TO THE INTEGRAL MULTIPLE
S28
Na = ∞
S29
END OF AUDIO-DATA RECORDING TASK

FIG. 5

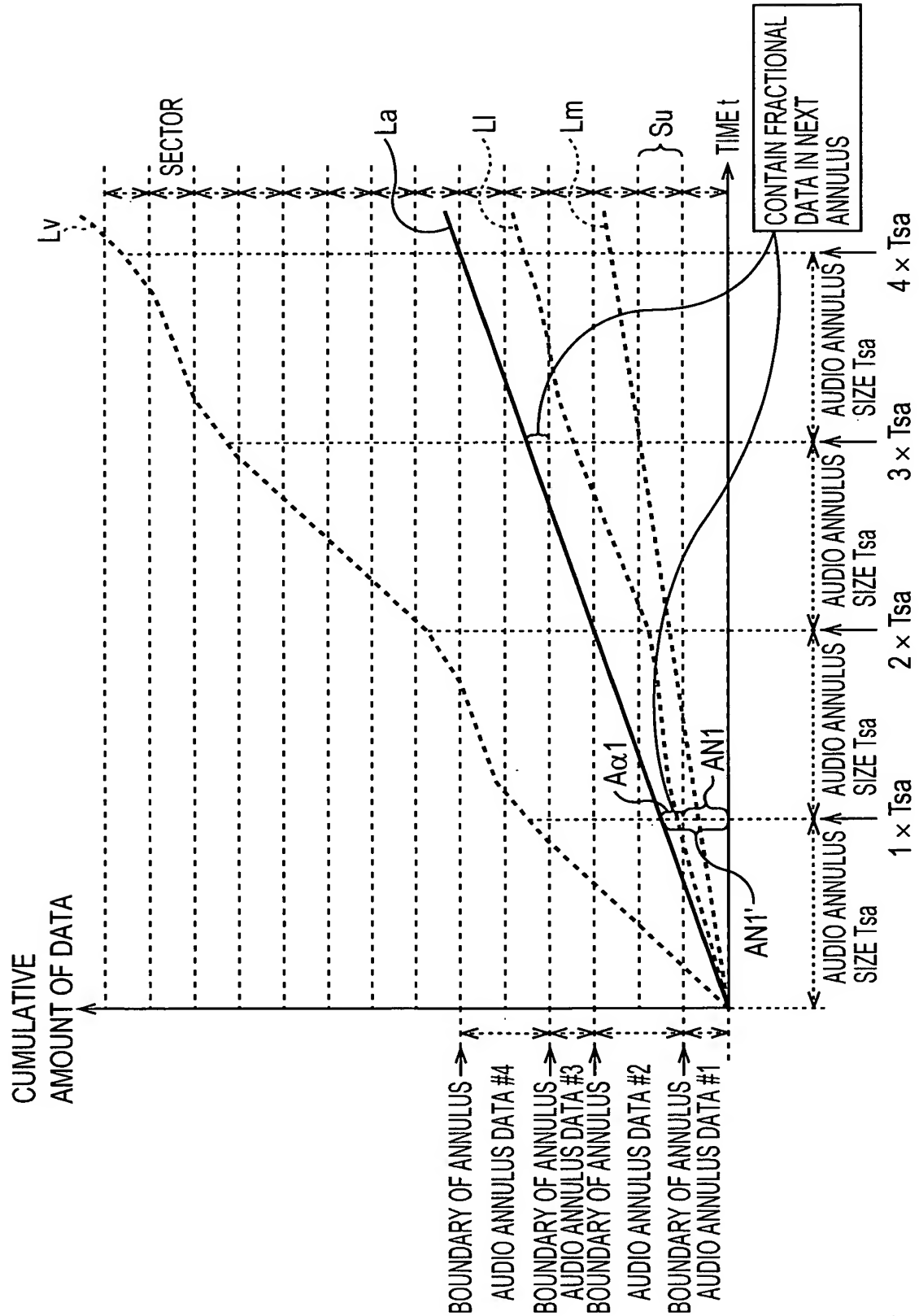

CUMULATIVE AMOUNT OF DATA
Lv
SECTOR
La
Ll
Lm
Su
TIME t
CONTAIN FRACTIONAL DATA IN NEXT ANNULUS
BOUNDARY OF ANNULUS
AUDIO ANNULUS DATA #4
BOUNDARY OF ANNULUS
AUDIO ANNULUS DATA #3
BOUNDARY OF ANNULUS
AUDIO ANNULUS DATA #2
BOUNDARY OF ANNULUS
AUDIO ANNULUS DATA #1
Aα1
AN1
AN1'
AUDIO ANNULUS SIZE Tsa
AUDIO ANNULUS SIZE Tsa
AUDIO ANNULUS SIZE Tsa
AUDIO ANNULUS SIZE Tsa
1 × Tsa
2 × Tsa
3 × Tsa
4 × Tsa

FIG. 6

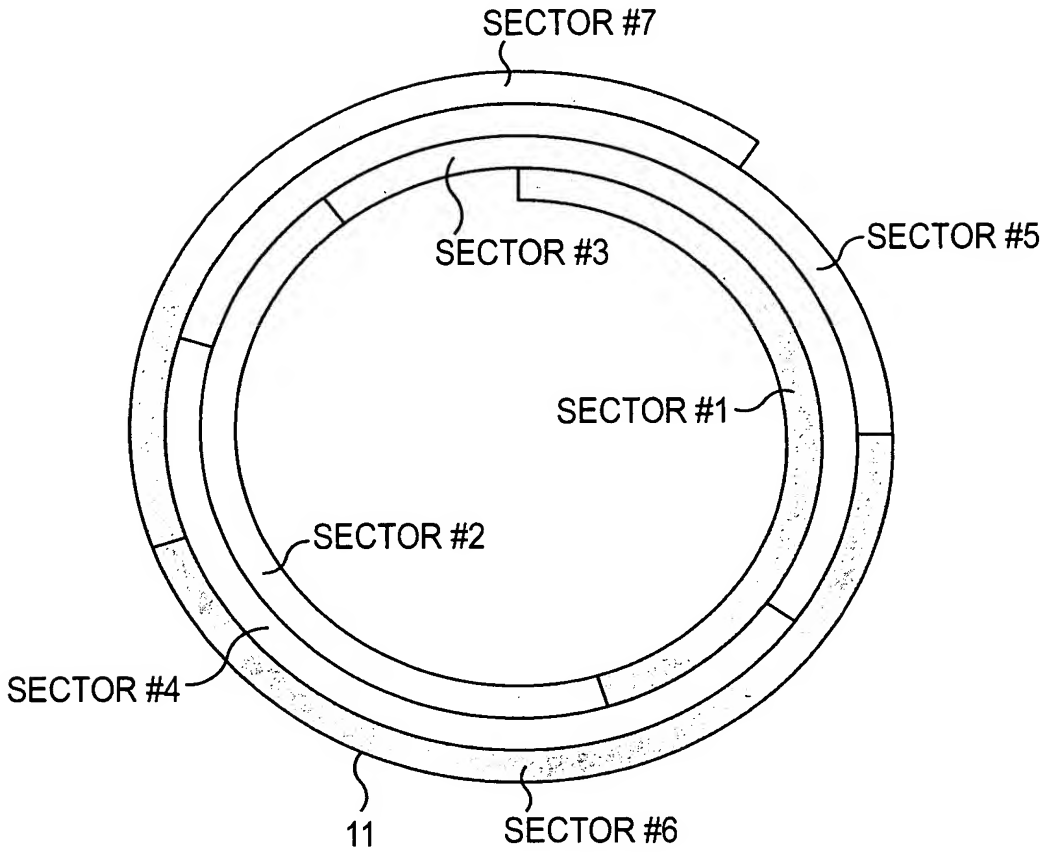

SECTOR #7
SECTOR #3
SECTOR #5
SECTOR #1
SECTOR #2
SECTOR #4
11
SECTOR #6

FIG. 7

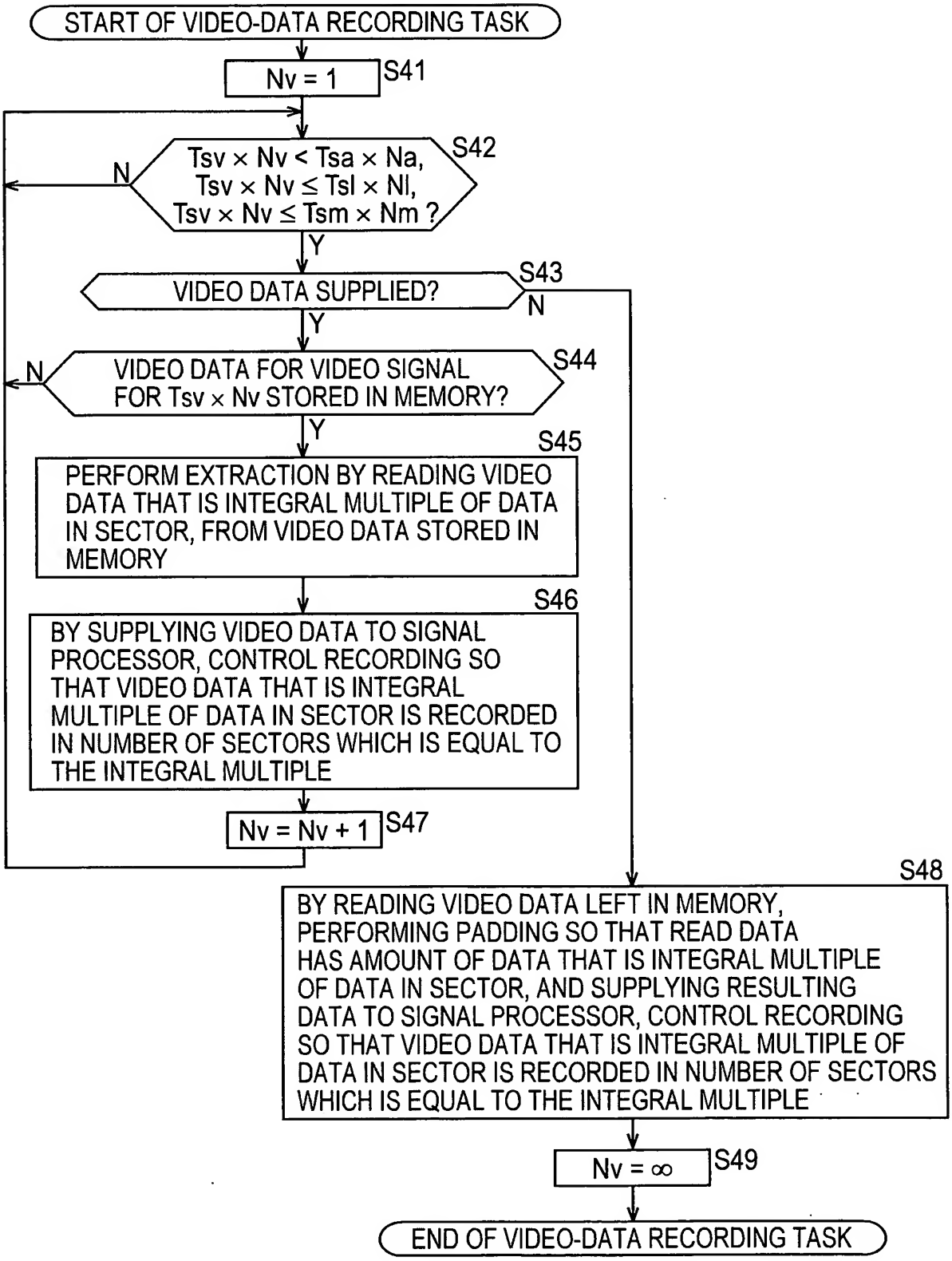

START OF VIDEO-DATA RECORDING TASK
Nv = 1
S41
Tsv × Nv < Tsa × Na,
Tsv × Nv ≤ Tsl × Nl,
Tsv × Nv ≤ Tsm × Nm ?
S42
N
Y
VIDEO DATA SUPPLIED?
S43
N
Y
VIDEO DATA FOR VIDEO SIGNAL FOR Tsv × Nv STORED IN MEMORY?
S44
N
Y
PERFORM EXTRACTION BY READING VIDEO DATA THAT IS INTEGRAL MULTIPLE OF DATA IN SECTOR, FROM VIDEO DATA STORED IN MEMORY
S45
BY SUPPLYING VIDEO DATA TO SIGNAL PROCESSOR, CONTROL RECORDING SO THAT VIDEO DATA THAT IS INTEGRAL MULTIPLE OF DATA IN SECTOR IS RECORDED IN NUMBER OF SECTORS WHICH IS EQUAL TO THE INTEGRAL MULTIPLE
S46
Nv = Nv + 1
S47
BY READING VIDEO DATA LEFT IN MEMORY, PERFORMING PADDING SO THAT READ DATA HAS AMOUNT OF DATA THAT IS INTEGRAL MULTIPLE OF DATA IN SECTOR, AND SUPPLYING RESULTING DATA TO SIGNAL PROCESSOR, CONTROL RECORDING SO THAT VIDEO DATA THAT IS INTEGRAL MULTIPLE OF DATA IN SECTOR IS RECORDED IN NUMBER OF SECTORS WHICH IS EQUAL TO THE INTEGRAL MULTIPLE
S48
Nv = ∞
S49
END OF VIDEO-DATA RECORDING TASK

FIG. 8

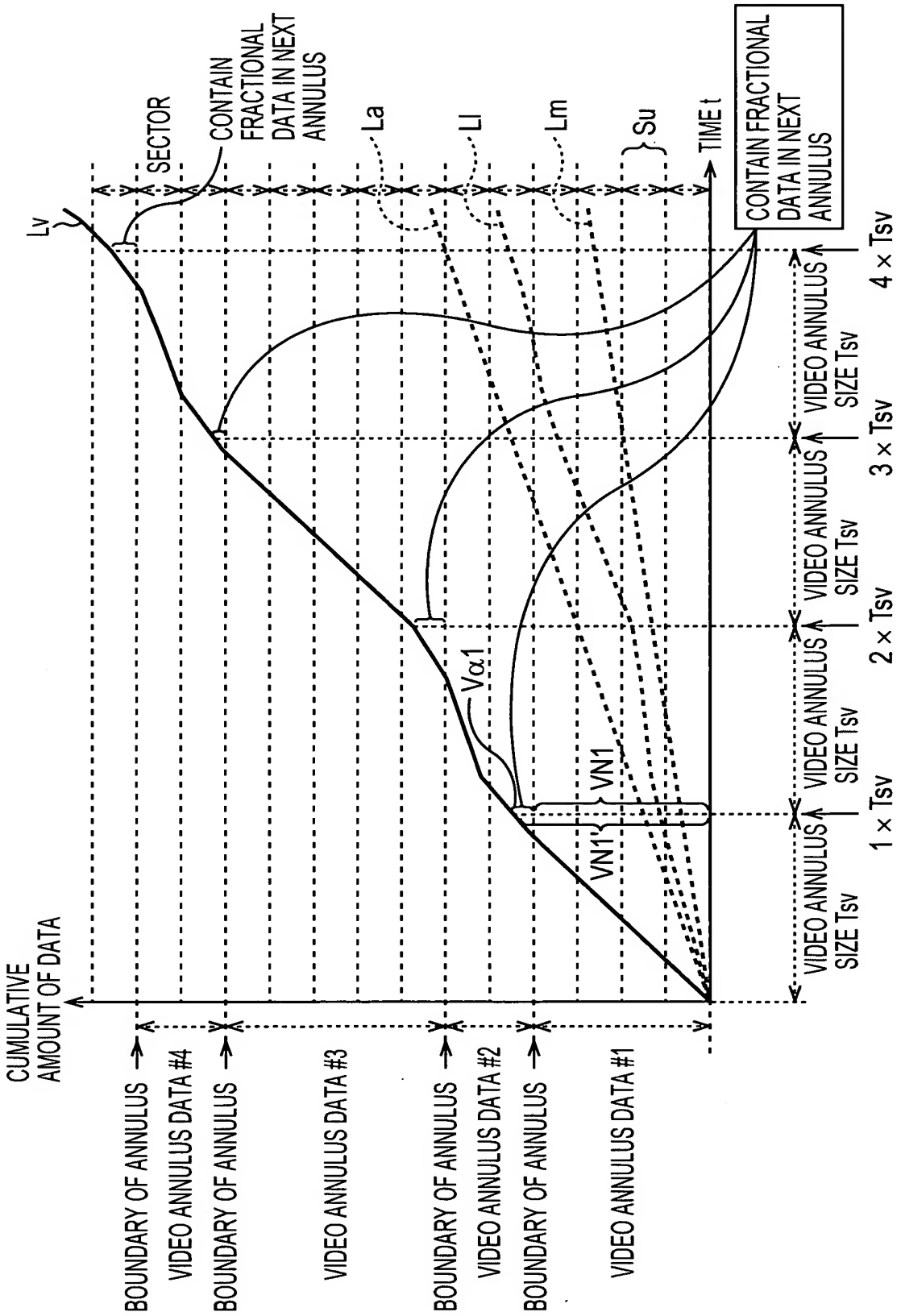

CUMULATIVE AMOUNT OF DATA
Lv
SECTOR
CONTAIN FRACTIONAL DATA IN NEXT ANNULUS
La
Ll
Lm
Su
TIME t
CONTAIN FRACTIONAL DATA IN NEXT ANNULUS
BOUNDARY OF ANNULUS
VIDEO ANNULUS DATA #4
BOUNDARY OF ANNULUS
VIDEO ANNULUS DATA #3
BOUNDARY OF ANNULUS
VIDEO ANNULUS DATA #2
BOUNDARY OF ANNULUS
VIDEO ANNULUS DATA #1
Vα1
VN1
VN1'
VIDEO ANNULUS SIZE Tsv
1 × Tsv
VIDEO ANNULUS SIZE Tsv
2 × Tsv
VIDEO ANNULUS SIZE Tsv
3 × Tsv
VIDEO ANNULUS SIZE Tsv
4 × Tsv

FIG. 9

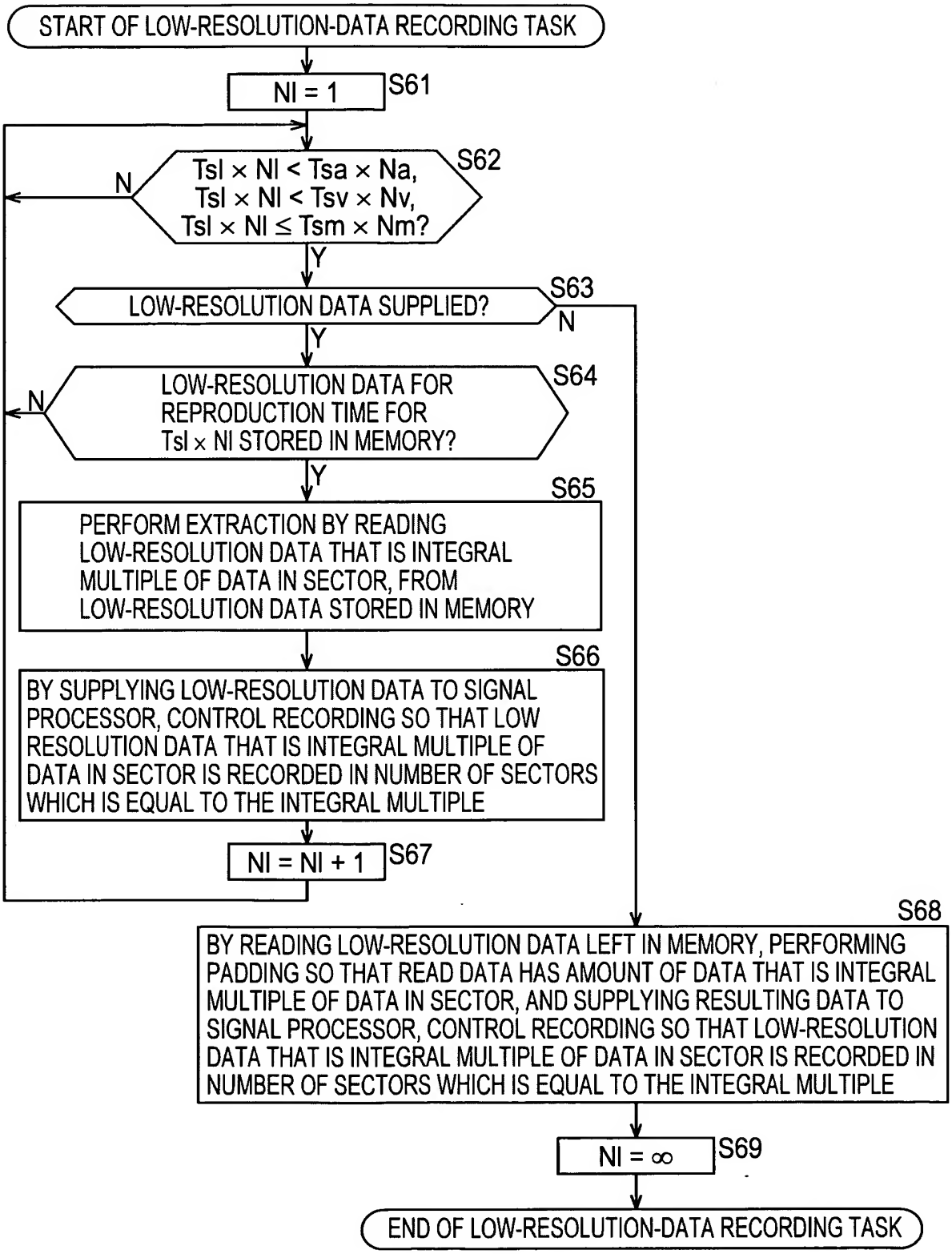

START OF LOW-RESOLUTION-DATA RECORDING TASK
NI = 1
S61
Tsl × NI < Tsa × Na,
Tsl × NI < Tsv × Nv,
Tsl × NI ≤ Tsm × Nm?
S62
N
Y
LOW-RESOLUTION DATA SUPPLIED?
S63
N
Y
LOW-RESOLUTION DATA FOR REPRODUCTION TIME FOR Tsl × NI STORED IN MEMORY?
S64
N
Y
PERFORM EXTRACTION BY READING LOW-RESOLUTION DATA THAT IS INTEGRAL MULTIPLE OF DATA IN SECTOR, FROM LOW-RESOLUTION DATA STORED IN MEMORY
S65
BY SUPPLYING LOW-RESOLUTION DATA TO SIGNAL PROCESSOR, CONTROL RECORDING SO THAT LOW RESOLUTION DATA THAT IS INTEGRAL MULTIPLE OF DATA IN SECTOR IS RECORDED IN NUMBER OF SECTORS WHICH IS EQUAL TO THE INTEGRAL MULTIPLE
S66
NI = NI + 1
S67
BY READING LOW-RESOLUTION DATA LEFT IN MEMORY, PERFORMING PADDING SO THAT READ DATA HAS AMOUNT OF DATA THAT IS INTEGRAL MULTIPLE OF DATA IN SECTOR, AND SUPPLYING RESULTING DATA TO SIGNAL PROCESSOR, CONTROL RECORDING SO THAT LOW-RESOLUTION DATA THAT IS INTEGRAL MULTIPLE OF DATA IN SECTOR IS RECORDED IN NUMBER OF SECTORS WHICH IS EQUAL TO THE INTEGRAL MULTIPLE
S68
NI = ∞
S69
END OF LOW-RESOLUTION-DATA RECORDING TASK

FIG. 10

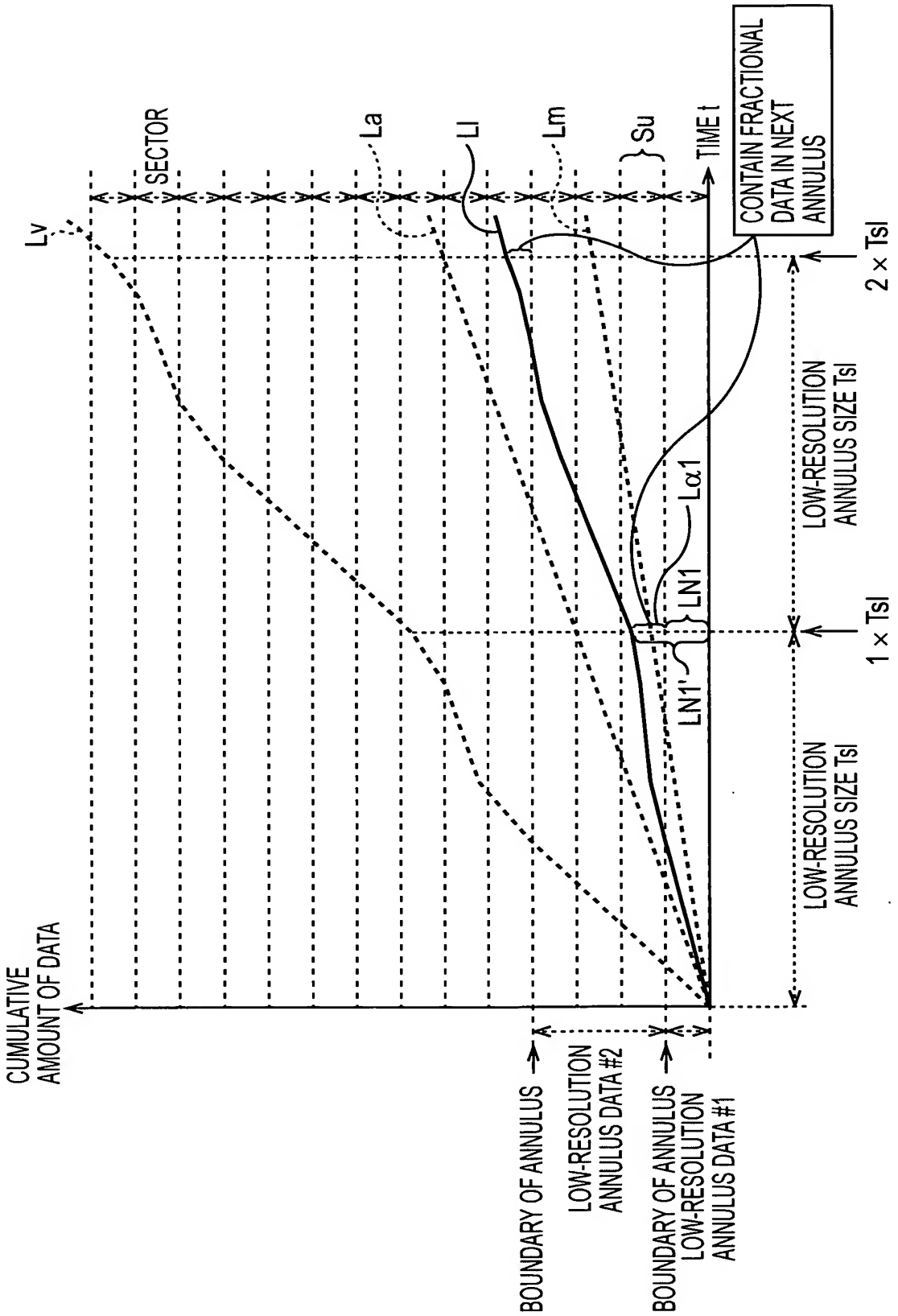

CUMULATIVE AMOUNT OF DATA
SECTOR
Lv
La
Ll
Lm
Su
TIME t
Lα1
LN1
LN1'
CONTAIN FRACTIONAL DATA IN NEXT ANNULUS
LOW-RESOLUTION ANNULUS SIZE Tsl
1 × Tsl
2 × Tsl
BOUNDARY OF ANNULUS
LOW-RESOLUTION ANNULUS DATA #2
BOUNDARY OF ANNULUS LOW-RESOLUTION ANNULUS DATA #1

FIG. 11

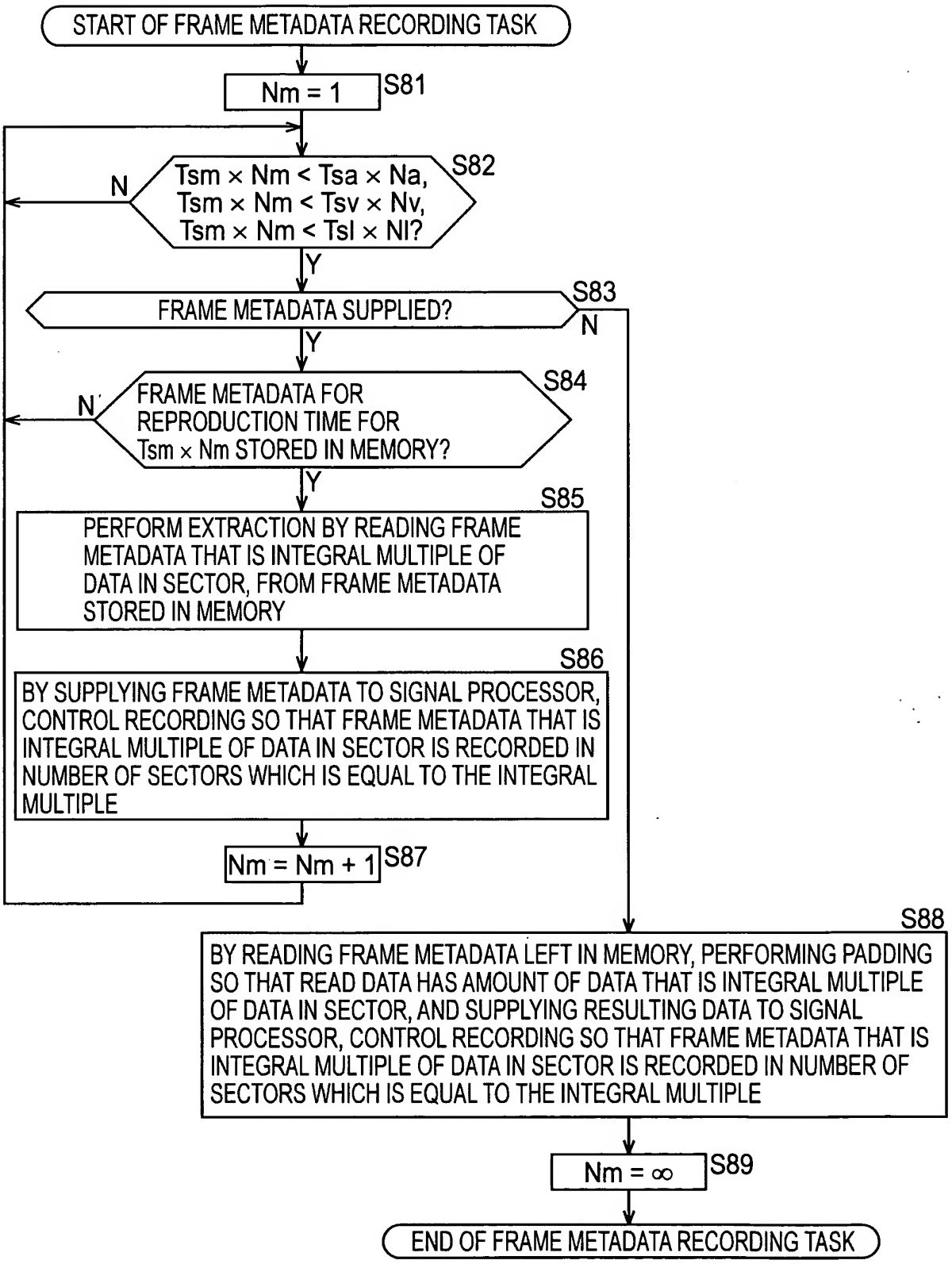

START OF FRAME METADATA RECORDING TASK
Nm = 1
S81
Tsm × Nm < Tsa × Na,
Tsm × Nm < Tsv × Nv,
Tsm × Nm < Tsl × Nl?
S82
N
Y
FRAME METADATA SUPPLIED?
S83
N
Y
FRAME METADATA FOR REPRODUCTION TIME FOR Tsm × Nm STORED IN MEMORY?
S84
N
Y
PERFORM EXTRACTION BY READING FRAME METADATA THAT IS INTEGRAL MULTIPLE OF DATA IN SECTOR, FROM FRAME METADATA STORED IN MEMORY
S85
BY SUPPLYING FRAME METADATA TO SIGNAL PROCESSOR, CONTROL RECORDING SO THAT FRAME METADATA THAT IS INTEGRAL MULTIPLE OF DATA IN SECTOR IS RECORDED IN NUMBER OF SECTORS WHICH IS EQUAL TO THE INTEGRAL MULTIPLE
S86
Nm = Nm + 1
S87
BY READING FRAME METADATA LEFT IN MEMORY, PERFORMING PADDING SO THAT READ DATA HAS AMOUNT OF DATA THAT IS INTEGRAL MULTIPLE OF DATA IN SECTOR, AND SUPPLYING RESULTING DATA TO SIGNAL PROCESSOR, CONTROL RECORDING SO THAT FRAME METADATA THAT IS INTEGRAL MULTIPLE OF DATA IN SECTOR IS RECORDED IN NUMBER OF SECTORS WHICH IS EQUAL TO THE INTEGRAL MULTIPLE
S88
Nm = ∞
S89
END OF FRAME METADATA RECORDING TASK

FIG. 12

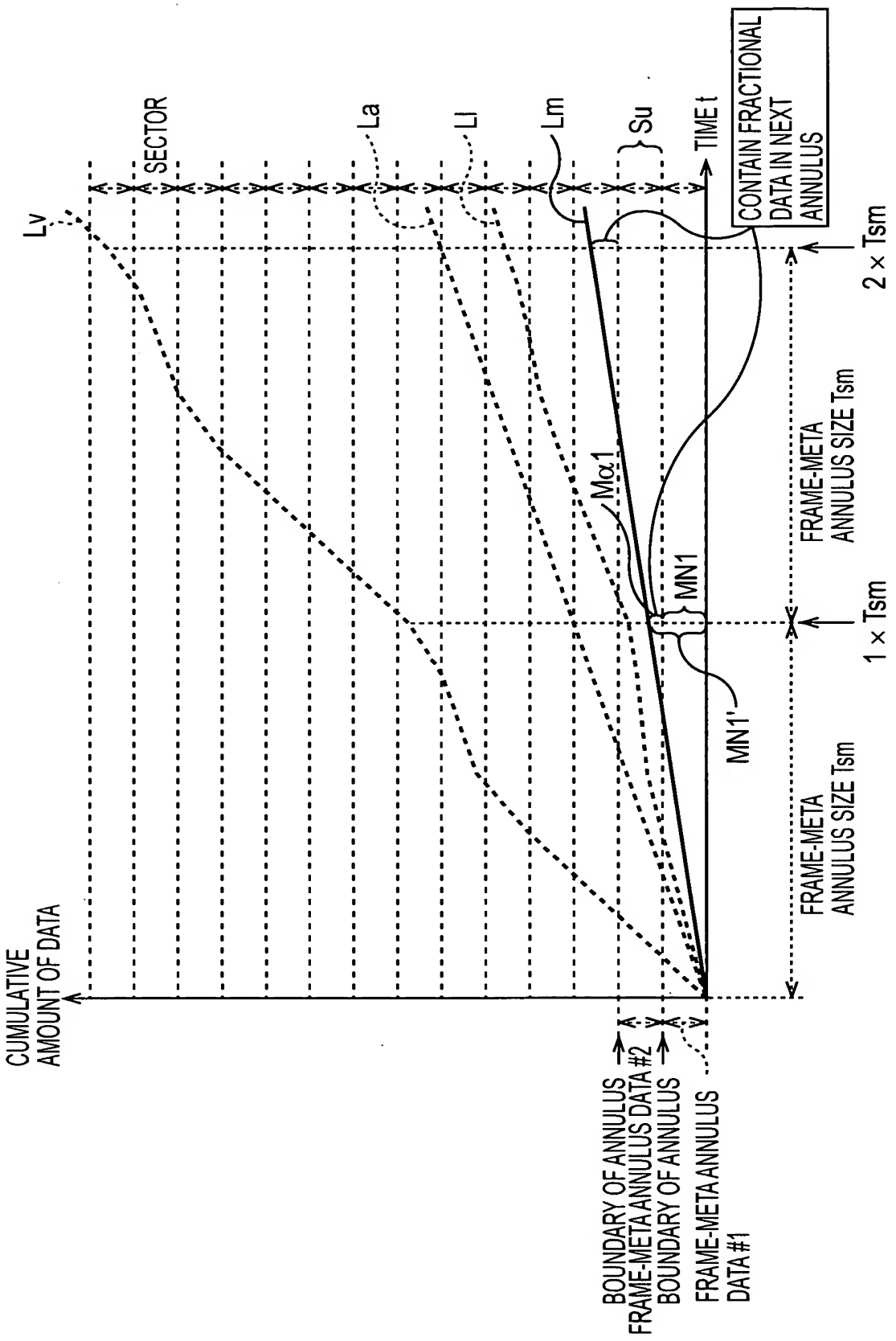

CUMULATIVE AMOUNT OF DATA
SECTOR
Lv
La
Ll
Lm
Su
TIME t
CONTAIN FRACTIONAL DATA IN NEXT ANNULUS
Mα1
MN1
MN1'
FRAME-META ANNULUS SIZE Tsm
FRAME-META ANNULUS SIZE Tsm
1 × Tsm
2 × Tsm
BOUNDARY OF ANNULUS FRAME-META ANNULUS DATA #2
BOUNDARY OF ANNULUS
FRAME-META ANNULUS DATA #1

FIG. 13

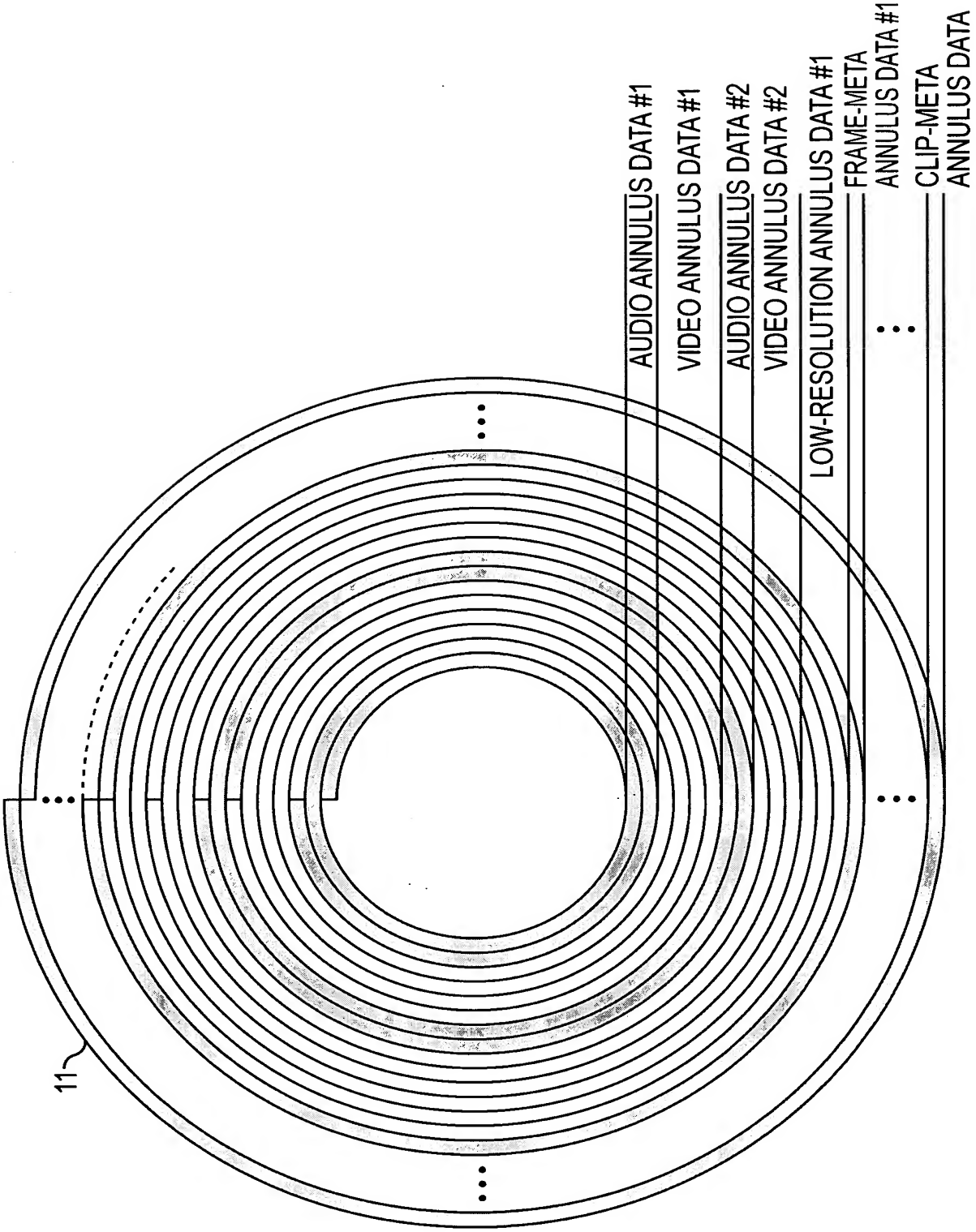

11
AUDIO ANNULUS DATA #1
VIDEO ANNULUS DATA #1
AUDIO ANNULUS DATA #2
VIDEO ANNULUS DATA #2
LOW-RESOLUTION ANNULUS DATA #1
FRAME-META ANNULUS DATA #1
CLIP-META ANNULUS DATA

FIG. 14A

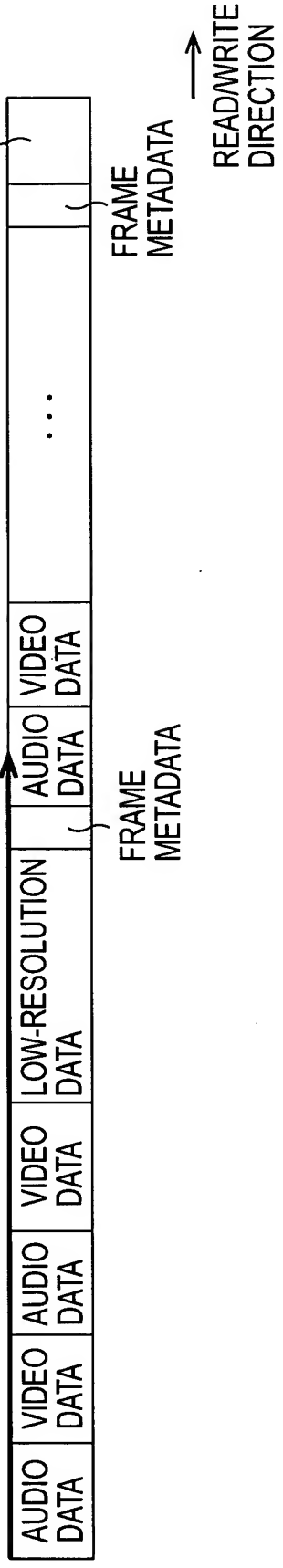


FIG. 14B

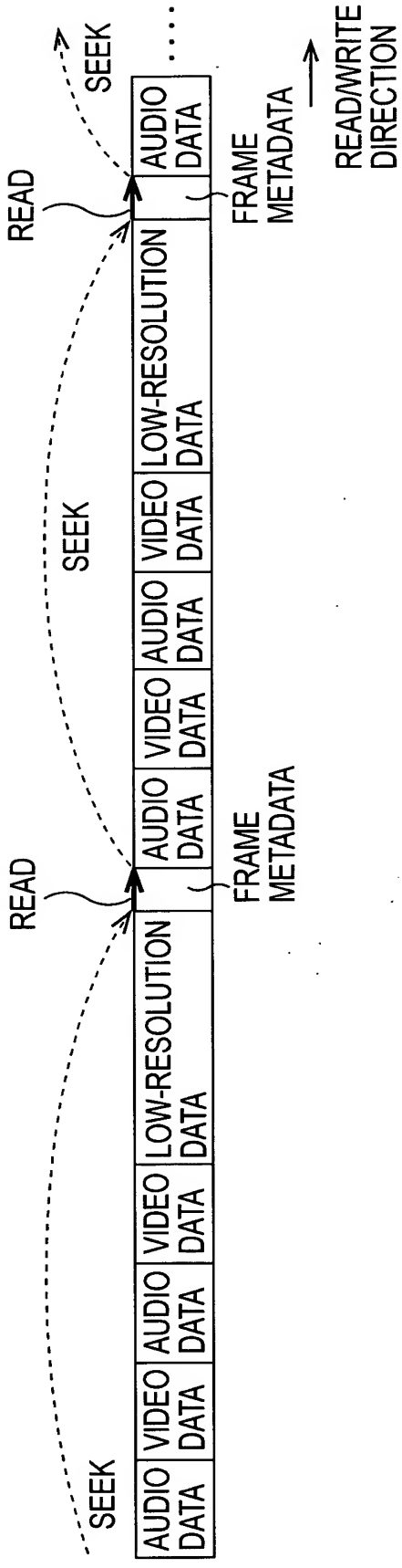


FIG. 15A

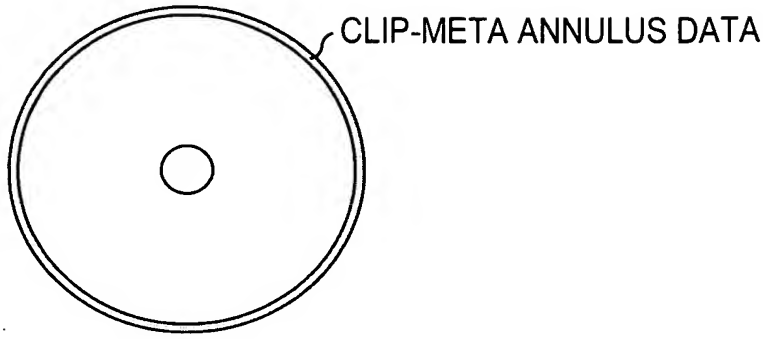


FIG. 15B

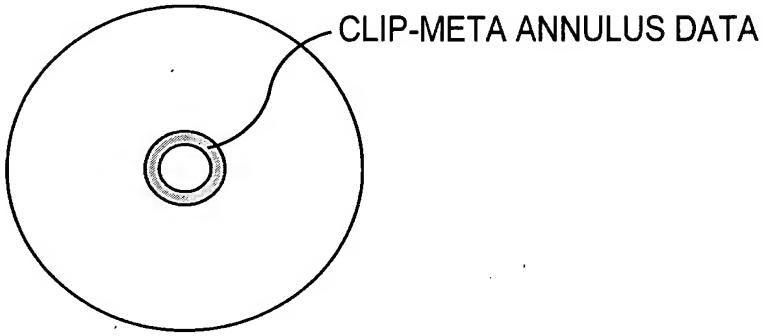


FIG. 15C

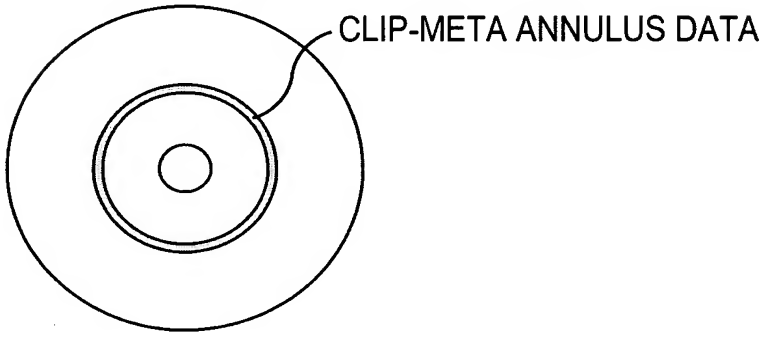


FIG. 15D

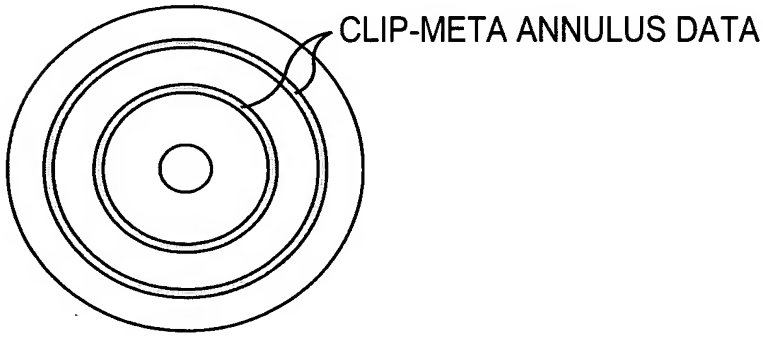
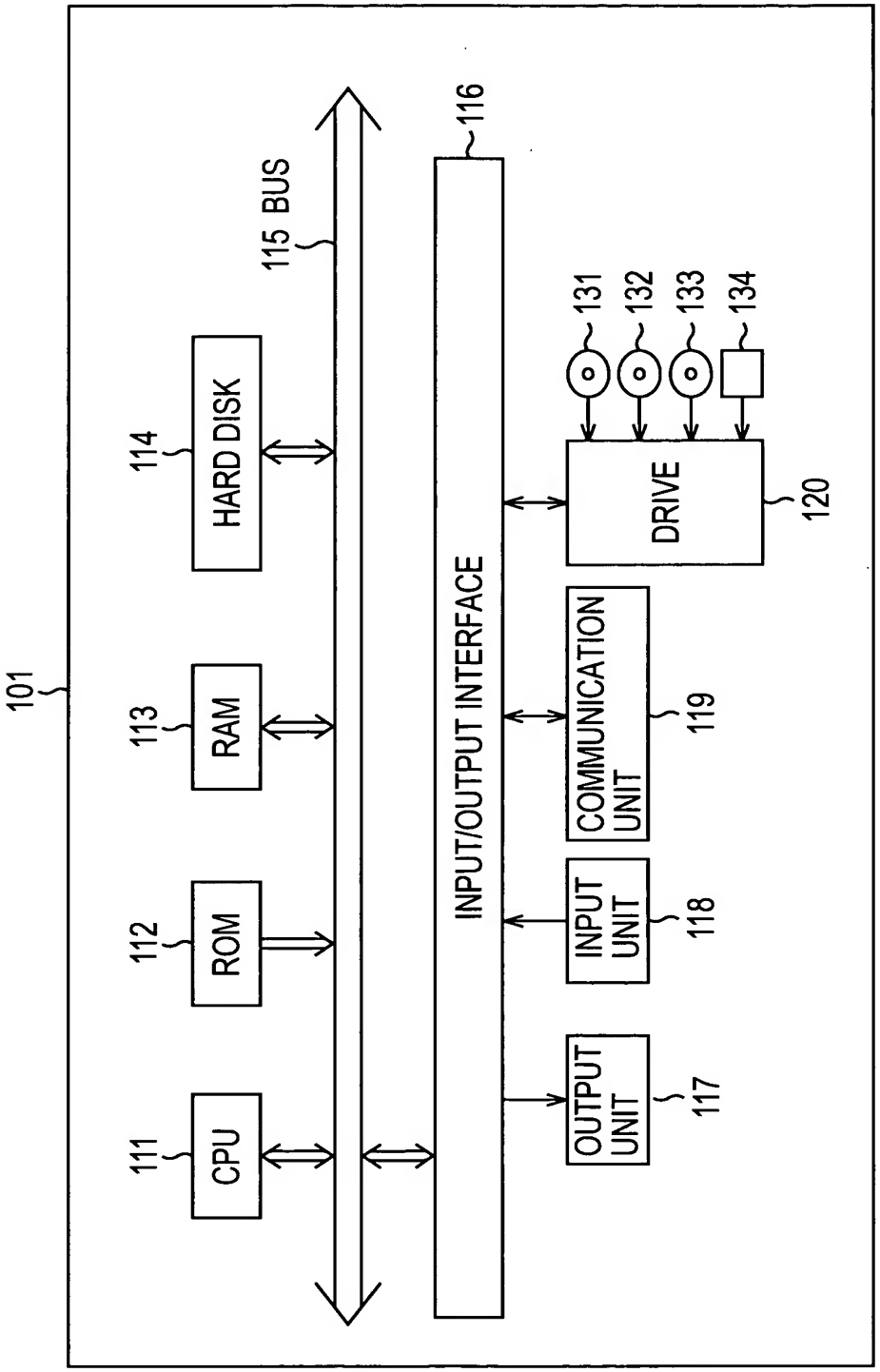


FIG. 16


101
111
CPU
112
ROM
113
RAM
114
HARD DISK
115 BUS
116
INPUT/OUTPUT INTERFACE
117
OUTPUT UNIT
118
INPUT UNIT
119
COMMUNICATION UNIT
120
DRIVE
131
132
133
134